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APPENDIX IV

(Clean copy of amended specification)

Joint arrangement

FIELD OF THE INVENTION

The invention relates to a joint arrangement for a surface structure, such as a protecting plate, element or the like, which surface structure together with one or several other surface structures is meant particularly for use as a temporary ground covering for temporarily protecting or coating and/or the like of the ground. In connection with each surface structure there has been arranged at least a joint arrangement for removable attachment of one or several adjacent surface structures to one another and a thermal insulation. The joint arrangement comprises at least one essentially plastic based, such as cellular, expanded, foamed plastic structured or a like thermal insulation layer. The joint arrangement further comprises a joint piece that is to be coupled by means of a locking assembly for coupling of the adjacent surface structures with each other essentially by the corners of the surface structures. The joint piece comprises a frame part having a generally right-angled geometric shape, such as a square-shape or a parallelogram. The locking assembly is arranged by projections placed at the corners of the frame part and extending therefrom, and preferably by recesses of the same shape that are placed on the underside of the surface structure. To the bottom surface of the surface structure there has been arranged preferably an integral support arrangement that comprises a platform structure projecting from the basic wall thickness of the surface structure.

BACKGROUND OF THE INVENTION

For the purpose above, particularly for covering a field of grass or ice, it is previously known to use most heterogeneous arrangements. For example, covering elements being sold nowadays by

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under the trademark TERRAPLAS represent particularly more developed solutions that are made of plastics by injection moulding. To minimize the mass of the prior ground covering element in question, it has been produced as a perforated structure in such a way that no actual thermal insulation effect may be achieved by this covering element. Correspondingly, the support arrangements to support the covering elements on or against the ground must furthermore be attached to the covering elements by means of totally separate auxiliary devices, which are assembled together in different work stages. In addition to this, locking arrangements connecting the covering elements to each other must be attached separately as well, so that a uniform and seamless covering may be achieved by this type of covering element. The “perforated” structure of the type of covering element above also does not enable exploitation of a so called green house phenomenon, particularly in connection with installing the covering elements over a grass field.

The perforated structure of the covering element of the prior art is naturally advantageous with a view to the breathing of or airflow to the ground, but the perforation causes, in addition to a “rough appearance and the thermal insulation problems described above, it to be possible for garbage to collect between the covering and the ground. This disadvantage naturally eliminates good points of the “perforated” covering element.

On the other hand, it is previously known to use styrox that has been surrounded by both sides of the same by plywood plate, particularly for covering ice fields. This type of solution is naturally not applicable as such to be installed particularly on a grass field, in which case totally separate foot structures are not being used to raise the covering structure apart from the ground. On the other hand, when being used in connection with an ice field, such ground covering causes

problems because the plywood plates tend to freeze to the ice, making loosening of the same laborious. In addition, this type of construction is very heavy, making storing as well as use of the covering for actual coating of the ground disproportionately difficult.

On the other hand, Finnish Patent Application No. 964199 discloses a protective structure, the thermal insulation of which comprises advantageously a plastic based, such as cellular, expanded, foamed plastic structure and/or a like thermal insulation layer, to the bottom surface of which there has been arranged an integral support arrangement that comprises a platform structure projecting from the basic wall thickness of the thermal insulation layer particularly in order to achieve an air space between the protective structure and the ground under the structure.

The solution in question from this Finnish application is very advantageous in practice because the thermal insulation placed between the ground and the protective structure gets more efficient thanks to the air space between the protective structure and the ground. In this case, the feet that are arranged as an integral platform structure directly to the bottom surface of the thermal insulation layer, prevent so called burning of the grass that is left under the protective structure. In the prior application there has been shown furthermore an advantageous embodiment for coupling the protective structures together with each other by means of joint arrangements. The joint arrangements are arranged to the protective structures in an integral manner during manufacturing of the same, and operate e.g. by quick-locking principle. During tests in practice, it has been found that the joint arrangement coupling the protective structures with each other in such respect could be improved so that the protective structures could be on the one hand assembled as easily as possible, but however locked in connection with each other reliably and seamlessly.

As another example, application document DE 27 17 625 discloses a covering assembly that is applicable as a temporary ground covering in principle, wherein three or four covering elements are placed on the ground and are attached by means of a joint piece coupling the covering elements together by the corners of the same. The ground covering has holding rings of suitable shape for arrowlike locking pins that are placed at the corners of the covering elements. The joint pieces are placed, however, essentially underneath the actual covering elements. That is why they must be sunk into the ground, and why they are not applicable as such to be used in connection with the type of thin surface structures as being discussed in this connection.

On the other hand, application document DE 25 58 967 discloses a base structure arrangement that is to be put together e.g. by stone based elements, in which e.g. four bottom plates are being attached by corners of the same by means of a square shaped joint piece. At the corners of the same there are pins that may be attached to corresponding holes being placed at the corners of the bottom plate. This solution is not applicable to be used for the type of use of the invention of the present applicant, because the bottom plates get supported by the corners of the same on the joint pieces. That is why an entirety operating satisfactorily enough may not be achieved in connection with thin plastic structured covering elements being included in invention in question.

Furthermore, application document DE 44 14 341 discloses separate joint arrangements to be used for connecting of concrete plates that are intended for the corresponding purpose as the above application document. This solution is not applicable to be used for the type of use of the invention in question of the present applicant, because an adequately functioning entirety may

not be achieved, particularly when being used in connection with thin plastic structured covering elements.

SUMMARY OF THE INVENTION

It is the aim of the joint arrangement according to this invention to achieve a decisive improvement for this purpose, in other words particularly for making the installation of a removable covering structure more efficient, and for securing staying together of the covering structure, and thus to raise substantially the level of the prior art. To achieve this aim, the joint arrangement according to the invention is primarily characterized in that the frame part of the joint piece, which joint piece has an open center, such as a framework-like structure, is arranged to pass or fit into the recesses existing in the platform structure, whereby the height of the recesses is arranged or selected to correspond essentially at least to the thickness of the frame part.

The most important advantages of the joint arrangement according to the invention include easy installation of the surface structures enabled by a joint piece, as well as simplicity and technical workability of the construction and manufacturing of the surface structures and joint piece. The invention enables a very smooth covering, which is applicable for most heterogeneous purposes, that is carried out by joint pieces that remain out of sight under the corners of the surface structures during the installation phase, whereby the surface structures to be coupled with each other may be connected to each other very quickly to form a surface structure that is adequately smooth and seamless. As an advantageous embodiment, the joint piece has a square shaped framework, such as a parallelogram, by means of which e.g. four surface structures may be connected with each other by means of one joint piece operating by quick-locking principle.

Projections are placed at the corners of the joint piece. The projections cooperate with locking recesses formed in the corners of the support structures. As an advantageous embodiment, the frame part of the joint piece is arranged to pass the recesses of the platform structure in such a way that the total thickness of the surface is not increased thereby. Furthermore, when male couplers that are placed advantageously at opposite edges of each surface structure, and female couplers that are placed correspondingly at opposite edges, are being used, with such couplers being placed furthermore at the bottom edges of the outer edges of the surface structures, the covering structure may be coupled in an extremely simple way by continuously "dropping" the next surface structure to be installed from above to its place, and by connecting the same to the already installed surface structures at the corners by means of joint pieces.

Advantageous embodiments of the joint arrangement according to the invention are represented in the dependent claims related to the same.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following description, the invention is illustrated in greater detail with reference to the appended drawings, in which:

Fig. 1 shows one advantageous surface structure related to the joint arrangement according to the invention,

Figs 2a – 2c

show furthermore the surface structure being shown in Fig. 1 as a detail seen from above (Fig. 2a), and some advantageous coupling means arrangements as partial side-views for the part of female couplers (Fig. 2b) and male couplers (Fig. 2c), and

Figs 3a – 3b

show an advantageous joint piece belonging to the joint arrangement according to the invention as a side-view and seen from above.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates to a joint arrangement for a surface structure, such as a protecting plate, element or the like, which together with one or several other surface structures creates a temporary ground covering. In connection with each surface structure there has been arranged at least a joint arrangement for removable attachment of one or several adjacent surface structures, and thermal insulation that comprises at least one, essentially plastic based, such as cellular, expanded, foamed plastic structured or a like thermal insulation layer 1.

The joint arrangement comprises a joint piece x that is to be coupled by means of a locking assembly y, for coupling the adjacent surface structures with each other essentially by their corners. Joint piece x comprises a geometric shape such as a right-angled parallelogram or a square shaped frame part. The locking assembly is arranged by projections y1 placed at the corners of the frame part, and preferably by recesses y2 of a shape adapted to receive the projections y1, which recesses y2 are placed underside the surface structure.

To the bottom surface of the surface structure there has been arranged preferably an integral support arrangement comprised of one or more platform structures 1a'' projecting from the basic wall thickness s of the surface structure, such as the thermal insulation layer 1. The platform structures 1a'' are separated by recesses 1a'. The frame part x1 of the joint piece x that has an

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open center, such as a frame-work like structure, is arranged to pass or fit into the recesses 1a' existing in the platform structure, whereby the height of the recesses is arranged to correspond essentially at least to the thickness h of the frame part x1.

With reference particularly to figs. 1 and 2, at each corner of the surface structure there has been arranged two recesses y2, one after the other at each side. With this configuration, with only one joint piece x, e.g. as shown in figs 3a and 3b, it is possible to couple four surface structures with each other by their corners or to couple only two surface structures side by side to form, for example, a straight gable edge.

Furthermore with reference to fig. 2a, the platform structure is arranged by single and square shaped platforms 1a'' that are placed advantageously all over the bottom surface of the surface structure, whereby the frame part x1 of the joint piece is arranged to fit within the recesses 1a' between platforms 1a'' and embed preferably four platforms 1a''.

As an advantageous embodiment, the surface structures are square shaped, the dimensions of which are e.g. 1500 x 1500 mm and the joint arrangement comprises coupling means z, such as male-female couplers z1, z2 placed at the outer edges of the surface structure. Both the male and female couplers z1, z2 are arranged at opposite outer edges of the surface structure as shown in fig. 1. Furthermore, as an advantageous embodiment with reference particularly to figs 2b and 2c, the male couplers z1 are arranged by projections being placed at the lower edges of the

longitudinal p1 outer edges of the surface structure, and correspondingly the female couplers z2 are arranged by recesses being placed at the lower edges of the crosswise outer edges p2. Using the male and female couplers z1 and z2, a subsequent surface structure may be coupled to a surface structure already installed over a ground surface. The male coupler z1 existing at the outer edge of the installed surface structure is coupled to the next surface structure by lowering the next surface structure into place adjacent the installed surface structure, so that the female coupler z2 mates with the male coupler z1. The corners of the adjacent surface structures are then locked together by means of joint piece x.

Furthermore, as an advantageous embodiment with reference to the views shown particularly in figs 2b and 2c, the male and female couplers z1, z2 comprise an auxiliary support/sealing assembly z3 wherein counterpart surfaces at the upper edge of the outer surface of the surface structure deviate essentially from the vertical direction at an angle α , preferably at an angle of 15° and are directed to opposite direction and/or to the same direction in respect to the surface structure. With counterpart surfaces being directed to opposite directions, it is first of all possible to achieve an auxiliary locking arrangement of a so called snap-joint type, and with counterpart surfaces being directed to the same direction as shown in figs 2b and 2c, the joint between the surface structures may get sealed.

The invention is not limited to the embodiments presented or described above, but it can be modified within the basic idea, even to a great extent. In this connection it is naturally possible

to equip the surface structure to be used in connection with the joint arrangement more abundantly by exploiting e.g. separate support arrangements according to traditional practice or auxiliary reinforcing plates or the like in the surface structures. It is furthermore naturally possible to install each single surface structure e.g. of several frame parts, that are connected to each other by suitable fastening arrangements either during manufacturing during installation on site. In this connection the surface structures may be connected by other types of joint pieces also, deviating from the type of joint piece being shown above, such as joint pieces which reach further to the center parts of the support structure.

It is furthermore naturally possible to use different kinds of coatings for coating either the upper surface or the bottom surface of the surface structure. Correspondingly, the surface structure as such, or the thermal insulation layer belonging to the surface structure, may be made of EPS-material, such as expanded polystyrene foam or styrox, XPS-material, such as extruded polystyrene foam, EPP-material, such as extruded polyethylene foam or e.g. extruded PVC-structural foam sheet. In a corresponding manner it is naturally possible to make the joint piece belonging to the joint arrangement of most heterogeneous materials, such as of wood, metal, plastics, reinforced plastics, ceramics, etc.

What is claimed is:

APPENDIX V

Figures 2b and 2c, marked to show changes.